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TEST PROTOCOL

FOR

OFFSHORE BOOM TRIALS

3rd DRAFT

MAY, 1987

by

S.L. ROSS ENVIRONMENTAL RESEARCH LIMITED

OTTAWA, CANADA

SLR
SL ROSS

May 25, 1987

Mr. Ed Tennyson
Oil Spill and Well Control
Technology Assessment and
Research Branch
Offshore Minerals Operations
Minerals Management Service
647 National Centre
Reston, Virginia
22092
U.S.A.

Dear Ed:

Please find attached a copy of the third and final draft of the test protocol for the proposed offshore boom trials for your perusal.

Best regards,

Ian A. Buist

Encl.

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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 OBJECTIVE

The objective of these trials is twofold: first, to determine whether or not the Canadian Coast Guard (CCG) equipment stockpiled in St. John's is suitable for responding to spills of waxy oils on the Grand Banks, and second, verify a protocol for determining the ability of offshore booms to hold oil without having to spill oil (the protocol is the product of several years of joint effort by the Oil and Hazardous Materials Simulated Environmental Test Tank (OHMSETT) consortium).

1.2 GOALS

More specifically, the goals of this study are to document and quantify:

1) the sea-keeping and waxy oil retention capabilities of the CCG St. John's Vikoma Ocean Pack and CCG Mulgrave Ro-Boom in seas representative of Grand Banks conditions;
2) the waxy oil recovery capabilities of the CCG St. John's Framo ACW-400 skimmer and the experimental Heavy Oil Skimmer (HOS) in seas representative of Grand Banks conditions; and
3) the sea-keeping and oil retention capabilities of a specially instrumented offshore oil boom in seas representative of offshore conditions.

1.3 TARGETS

The tests are proposed for one day in the time period of September 1 to October 31, 1987 off St. John's, with the week of September 21 as the target.

2.0 GENERAL INFORMATION

2.1 THE OIL

Up to 80 m^3 of a viscous crude oil, with properties similar to those of waxy Grand Bank's crude oils, is proposed for the tests. Sufficient volumes of oils from exploration activities on the Grand Banks do not exist.

2.1.1 Oil Volume

Based on experience with other such tests (Nordvik 1986 pers. comm.; Griffiths 1986 pers. comm.), approximately 80 m^3 will be needed to develop slick thicknesses in the boom pocket approximating full scale conditions. Figure 1 shows the size of an 80 m^3 slick in relation to a 200 m length of boom held in a catenary.

2.1.2 Oil Properties

Waxy crude oils from exploration activities on the Grand Banks are not available in sufficient quantities for the proposed tests. As such, it is necessary to substitute an oil produced in Canada, doped with wax or Bunker C to produce properties similar to those of waxy oils. The properties of Alberta Sweet Mixed Blend (ASMB) crude oil are compared to those of three waxy Grand Banks crudes in Table 1. The primary difference between ASMB and the waxy crudes is pour point. When weathered for ten hours as a 10 cm thick slick at 15 ^{o}C the pour point of ASMB rises to $0^{o}C$. A small percentage of wax will be added to the ASMB crude oil to raise its pour point when fresh to the 0^{o} - $5^{o}C$ range (so it can be easily released) and raise its pour point when weathered to the $15^{o}C$ range (so it exhibits typical waxy oil behaviour after release).

FIGURE 1 - RELATIVE SIZE OF AN 80 m3 CONTAINED SLICK

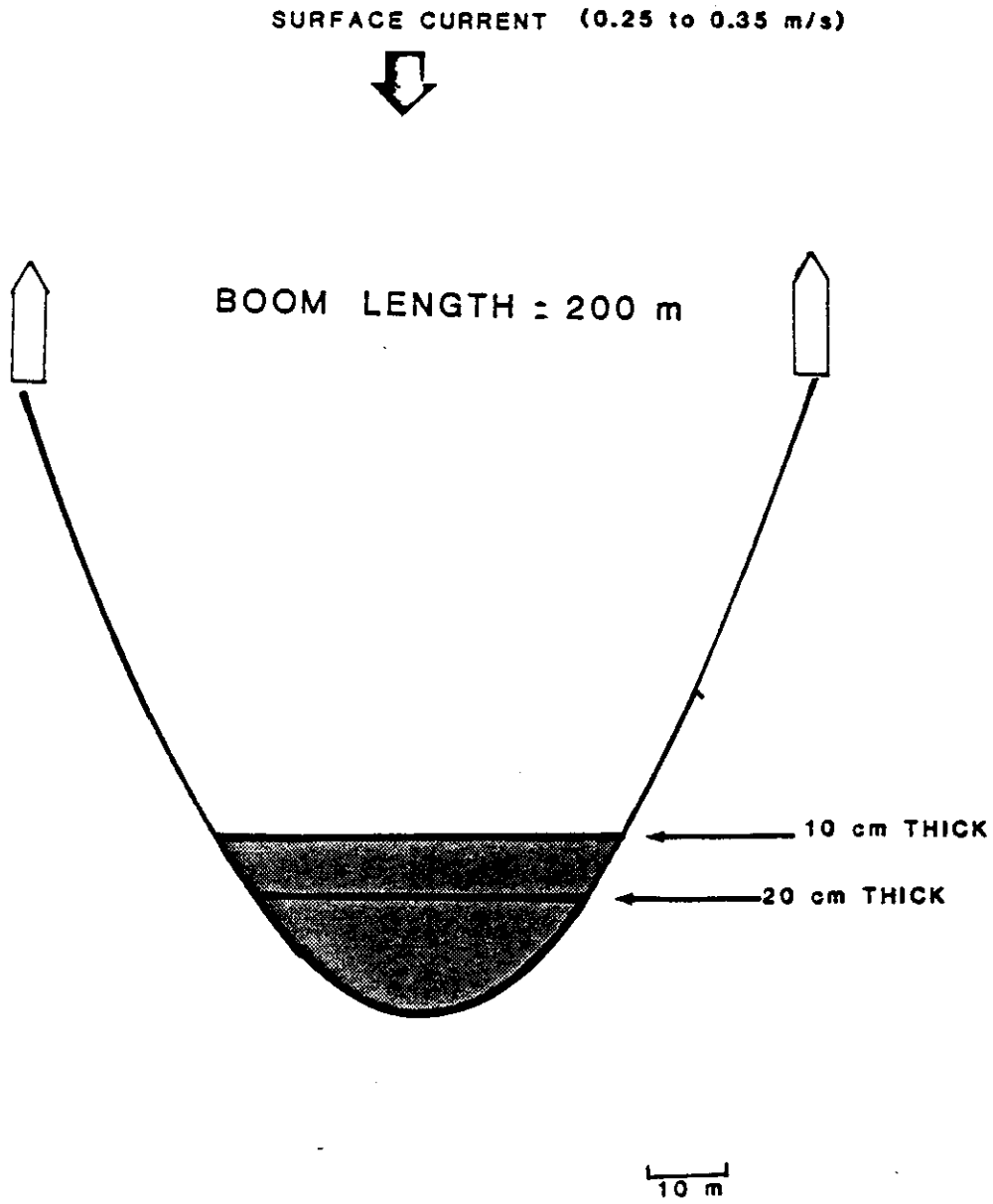


TABLE 1

COMPARISON OF OIL PROPERTIES

OIL	API GRAVITY	DENSITY @ 15°C (KG/M³)	VISCOSITY (mPas)	POUR POINT (°C)
HIBERNIA B-27	36	844	11 @ 15°C	6
AVALON J-34	29	877	93 @ 15°C	10
TERRA NOVA K-08				
DST-1	31	871	8.7 @ 50°c	27
DST-2	32.9	861	16.7 @ 25°C	12
ALBERTA SWEET MIXED BLEND	36	845	9.2 @ 15°C	-8

2.2 PROPOSED TEST LOCATION

The proposed test area has been selected in consultation with the Regional Ocean Dumping Advisory Committee (RODAC) based on the following criteria:

* any minor oil losses must drift out to sea (SSW currents and westerly winds)
* at least 100 m water depth
* at least 20 nm offshore
* within 2 to 3 hours sailing from St. John's.

This translates to an area (Figure 2) centered at 47° 40'N, 52° 03'W east of St. John's. An area, rather than a specific site, is suggested to permit flexibility in site selection on the day of the trials and to account for "over the ground" drift during the trials. It should be noted that a dry run (involving no oil) of the test procedures would be conducted near St. John's prior to the actual tests.

The site and the possible time window for the trials (September 1 to October 31, 1987) have been specifically chosen to avoid conducting the trials during the fishing season and to optimize the chances of suitable sea and weather conditions.

2.3 WEATHER AND SEA CONDITIONS

This section contains a general description of the physical environment of the proposed test area. The weather and sea condition constraints on the test may be found in Section 2.5.

FIGURE 2 - LOCATION OF SUGGESTED TEST AREA

2.3.1 Winds

Figure 3 shows wind roses and directional frequency data for the proposed site in fall. In September westerly (SW - NW) winds occur 54% of the time, at speeds less than 16 knots about 60% of the time. In October westerly winds occur about 48% of the time, at speeds less than 16 knots about half the time. Persistance information is given in Section 2.5- Operating Constraints.

2.3.2 Currents

Residual currents in the proposed area set to the southwest at speeds on the order of 15 cm/s (0.3 knots). The greatest combined current (wind plus tide plus residual) reported is slightly in excess of 1 knot.

2.3.3 Waves

Waves in the proposed study area exceed 2 m 50% of the time in fall. Figure 4 shows the occurrence of favourable waves for containment and recovery (i.e., waves less than 1 m in height and between 1 m and 2 m in height with periods longer than 6 s) for the Grand Banks. Since waves on the Grand Banks tend to be slightly higher than those closer to shore, the graph is conservative. Favourable waves can be expected about 20 to 50% of the time in fall; the highest probabilities for favourable waves occur in early fall.

2.3.4 Temperatures

In fall the average air temperature is in the 10°C range; the sea temperature is in the 5°C range.

FIGURE 3 FALL WINDS

PERCENTAGE FREQUENCY BY DIRECTION

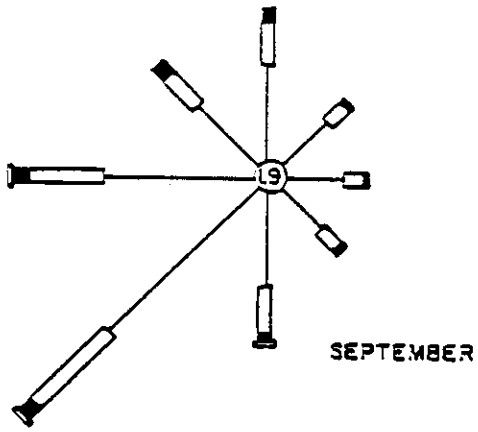
September

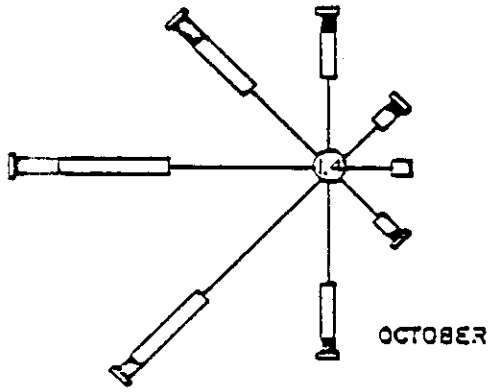
	St. John's	SSMO4
N	9.5	11.7
NE	8.5	7.0
E	4.0	5.7
SE	5.5	6.1
S	9.5	13.5
SW	24.0	25.2
W	28.0	18.1
NW	9.0	10.7
Calm	2.0	1.9

October

	St. John's	SSMO4
N	11.0	10.8
NE	5.0	5.7
E	3.5	4.7
SE	5.5	6.2
S	11.5	13.1
SW	21.5	20.8
W	26.5	23.1
NW	13.5	14.3
Calm	2.0	1.4

WIND ROSES
SSMO AREA 4
SOUTHEAST NEWFOUNDLAND





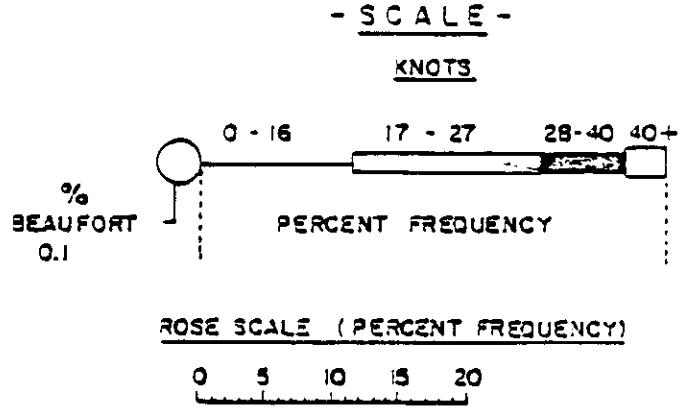
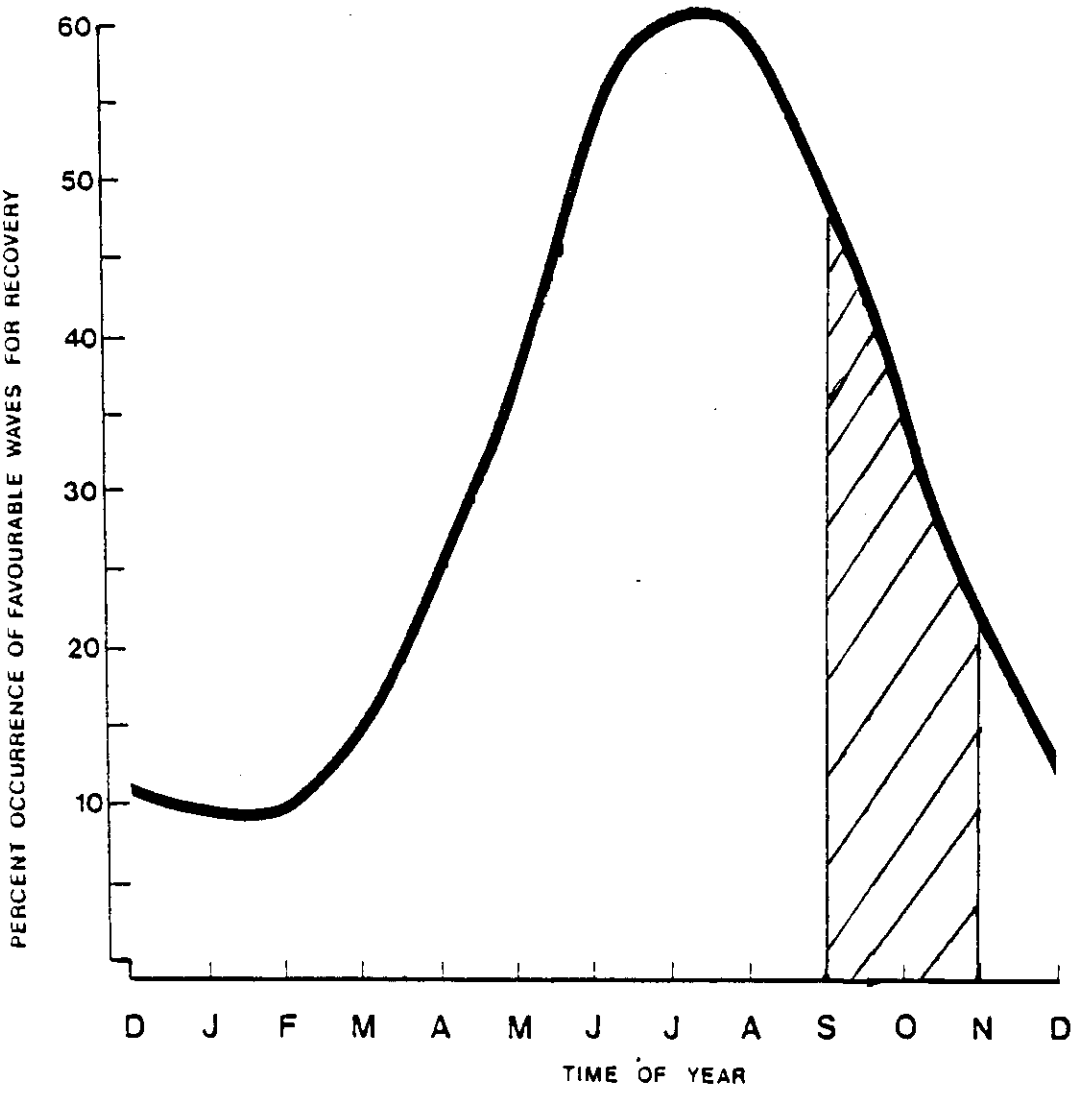


FIGURE 4

OCCURRENCE OF FAVOURABLE WAVES FOR CONTAINMENT/RECOVERY



2.3.5 Visibility

Figure 5 shows visibility statistics for the region of the proposed site. In September, visibility is less than 2 nm about 18% of the time; in October this decreases to about 10% of the time. At St. John's, in September, an average of 7 days are foggy; in October an average of 8 days are foggy.

2.3.6 Precipitation

Figure 6 shows the occurrence and type of precipitation in the area of the proposed test site. In fall there is no significant precipitation 70% of the time.

2.4 PROJECT TEAM

This project is being supported by the Canadian Coast Guard, Environment Canada, the U.S. Environmental Protection Agency, the U.S. Minerals Management Service and the U.S. Coast Guard. The project is directed by a Steering Committee comprised of nine members as shown on Figure 7. Mason and Hanger, operators of the EPA OHMSETT facility will undertake all oil discharge, boom and skimmer measurements, S.L. Ross Environmental Research Limited, D.F. Dickins Associates Limited and Seakem Oceanography will be responsible for project co-ordination and planning, oceanographic and meteorological measurements and assessment of the Coast Guard booms. The Canadian Coast Guard will co-ordinate logistics, vessels and manpower.

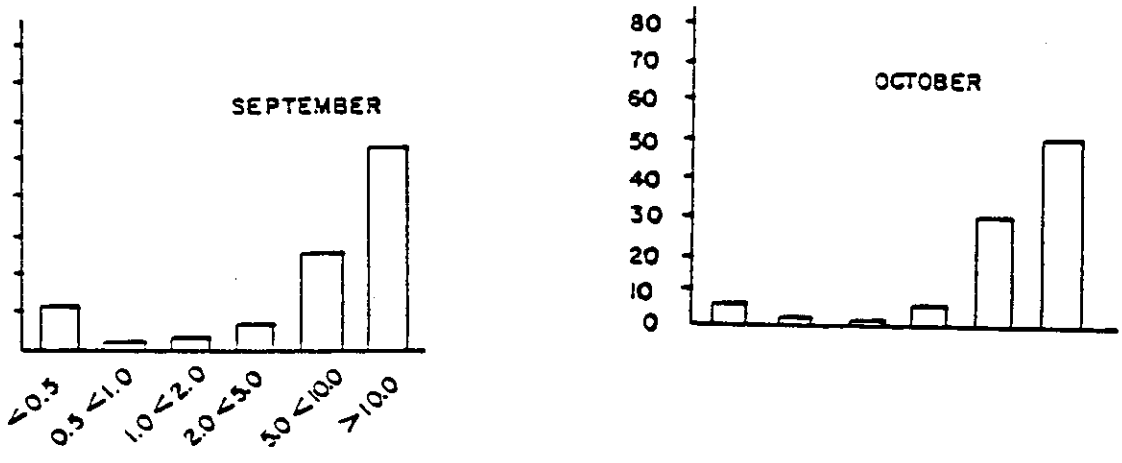


FIGURE 5 VISIBILITY (nautical miles)
SSMO AREA 4
SOUTHEAST NEWFOUNDLAND

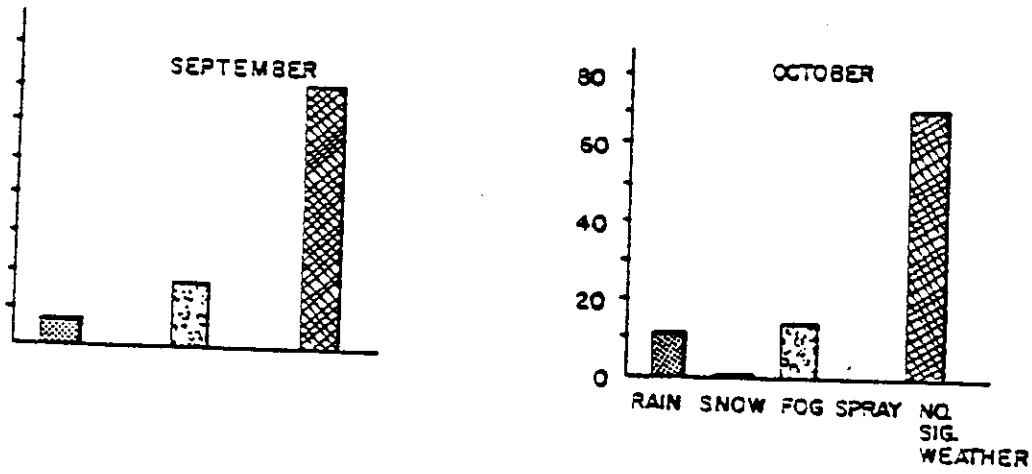
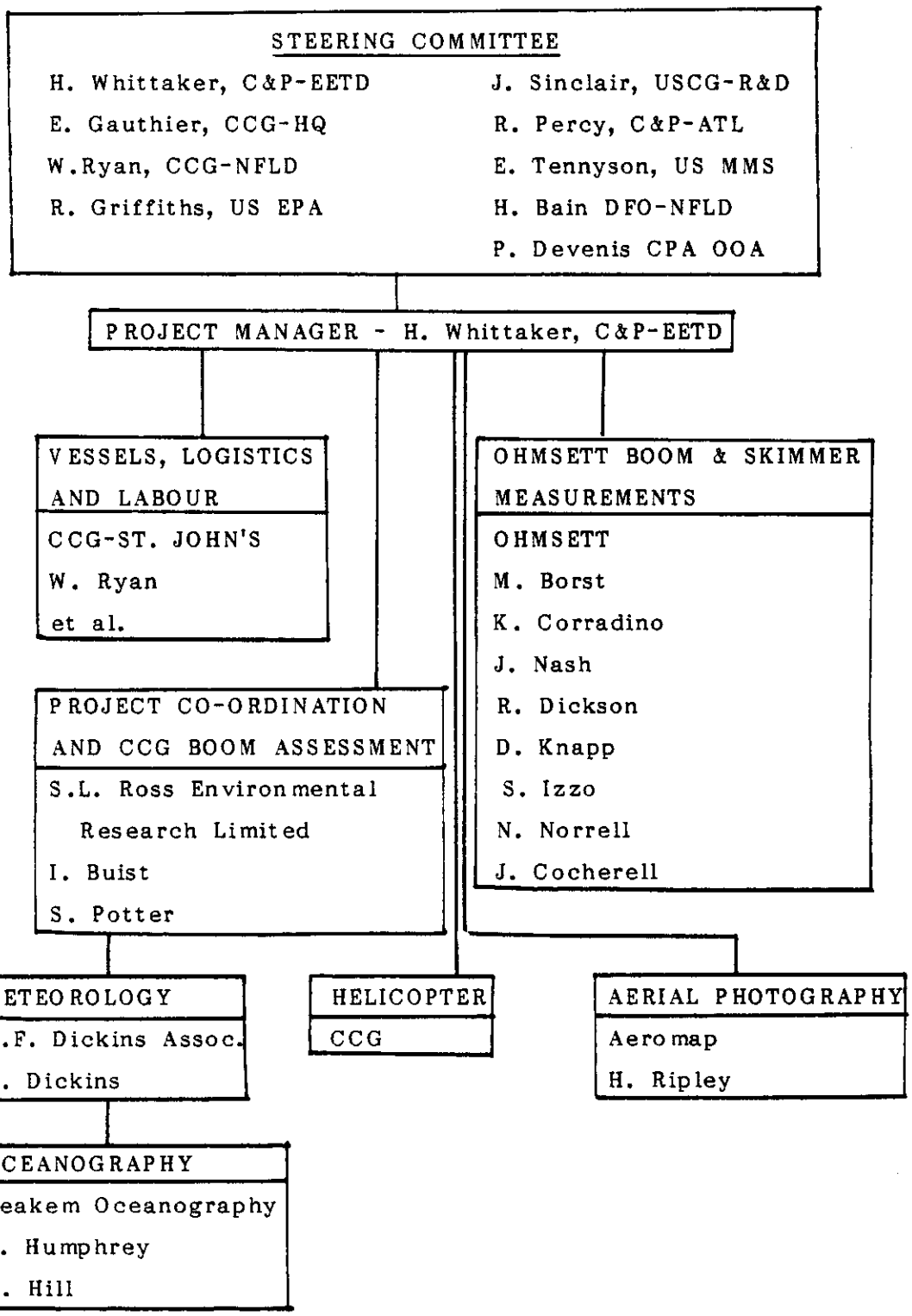


FIGURE 6 PRECIPITATION
SOUTHEAST NEWFOUNDLAND
SSMO 4

FIGURE 7

PROJECT TEAM ORGANIZATION



2.5 OPERATING CONSTRAINTS

The following defines the weather and sea state "window" necessary for commencement of the tests on a particular day:

* wind from 180-330° with speeds less than 20 knots (10 m/s) for 12 hrs during daylight
* visibility greater than 3 km
* ceiling at least 150 m (preferably greater than 500 m)
* wave height between 1 and 2 m, highest 1/3 of waves
* westerly winds predicted to last for at least 36 hr
* no precipitation

Taking into account the first three criteria (wind, visibility and ceiling) an investigation of the historical frequency of occurrence of the weather window was undertaken by AES. In August there were an average of 4.4 occurrences per year, in September there were an average of 3.9 occurrences per year and in October an average of 4.1 per year. Factoring in sea state, precipitation and VFR flying conditions would reduce these numbers to an unknown extent. Westerly winds for more than 36 hrs occurred about 5 times per month; westerly wind for more than 48 hrs occurred about 3 times per month.

3.0 TEST PLAN

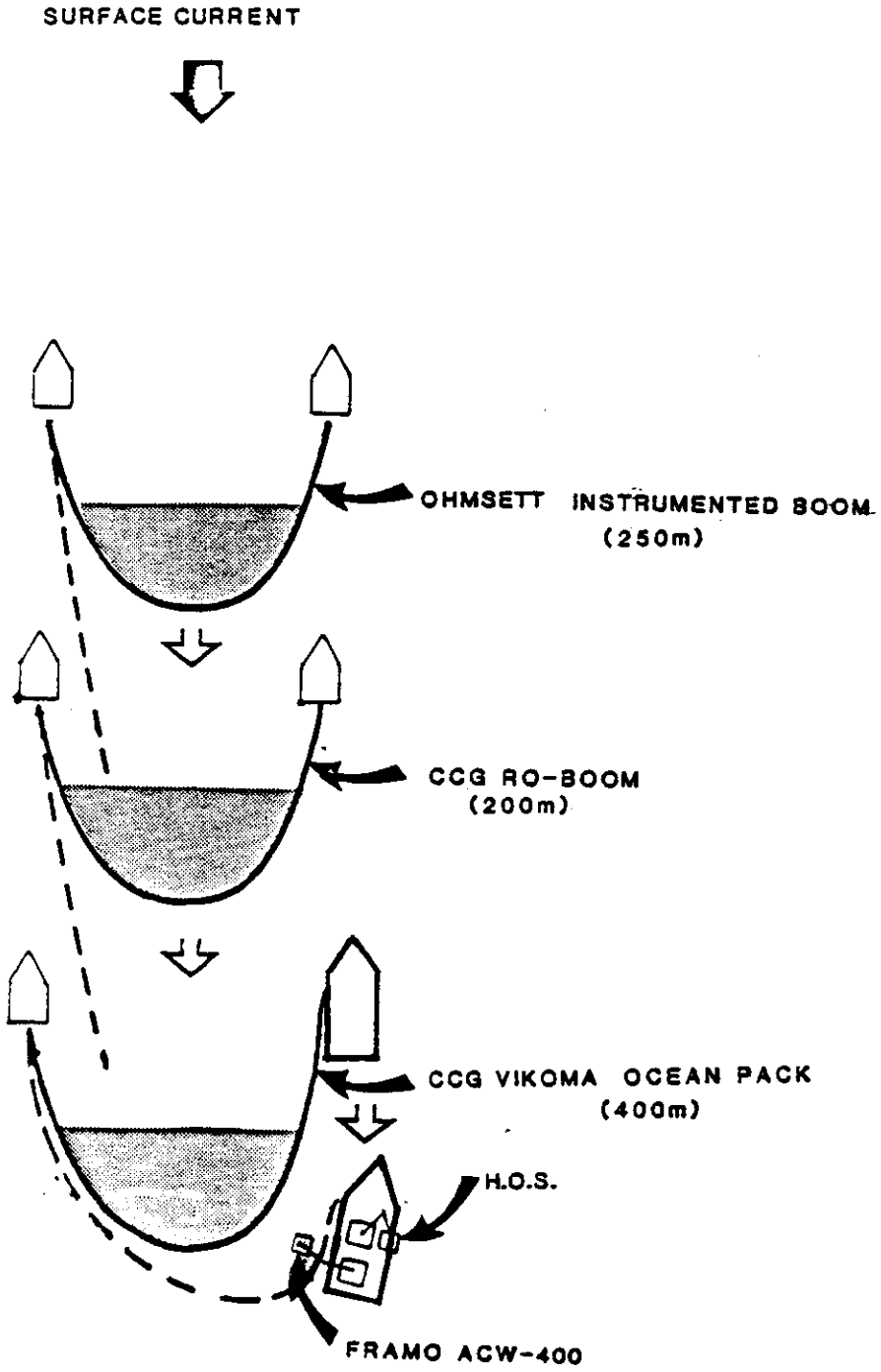
3.1 GENERAL

The general experimental plan is as follows. The 250 m OHMSETT instrumented boom will be deployed first and monitored for 1 h without oil. Once the next boom is set (see Figure 8) and the oil has been discharged into the OHMSETT instrumented boom, readings will be taken for 1 hour in a relative current of about 0.25 m/s (1/2 knot). After this the two boats will speed up until significant entrainment losses occur (at about 0.5 m/s = 1 knot). The lost oil will be collected by the 200 m Ro-Boom (from CCG Mulgrave) being towed behind. After this, one tow boat on the OHMSETT instrumented boom will drop back into the mouth of the Ro-Boom and let go of its end of the instrumented boom thus allowing the oil to drift back into the Ro-boom. The CCG St. John's Vikoma Ocean Pack boom (400 m) will be deployed behind the Ro-Boom to collect any escaping oil. The same test procedure used for the OHMSETT instrumented boom will be repeated for the Ro-Boom.

Once the oil is in the Vikoma Ocean Pack boom it will be observed for 1 hour (no "testing to first oil loss" will be conducted) after which the skimmer tests will commence. A Vikoma Sea Pack boom will be on-site in case of any problems with the Vikoma Ocean Pack boom.

The skimmer testing will involve 20 minutes skimming with the Framo ACW-400 from the side of a supply boat holding the short leg of the Vikoma Ocean Pack boom in a "J" configuration followed by 20 minutes skimming with the experimental Coast Guard Heavy Oil Skimmer (HOS). All the remaining oil will then be recovered by the skimmer with the better performance. The recovered oil will be pumped into two 22 m^3 (5,000 gal) deck tanks and from there back into the dumb barge. There will be sufficient tankage available to recover all the oil, including volume increases due to emulsification. A steam siphon will be inserted in the hose between the skimmer and the deck tanks to break any emulsions.

FIGURE 8 SCHEMATIC OF TEST PLAN



3.2 PRE SPILL MONITORING AND TEST INITIATION

About three weeks prior to the chosen test week, A.E.S. long-range weather forecasts will be obtained for the general test site.On the Monday, weather permitting, a dry-run will be conducted and a test day and location will be selected based on A.E.S. short-range weather and sea state forecasts. An overflight of the test site will take place on the afternoon prior to the chosen test day to check the area for fishing activity and birds. A wave rider buoy with radio telemetry will be placed at the test site after the dry run to allow the waves to be monitored prior to the test day.

3.3 OIL DISCHARGE

It is by no means certain that the entire 80 m^3 of oil will be discharged. The oil will be pumped at a rate of 2 to 4 m^3/min, from a small barge positioned in the mouth of the OHMSETT boom. During this operation a helicopter will hover above the boom to monitor the size of the slick and any oil losses. Should the slick fill 75% of the boom area or significant oil losses occur the oil discharge will be stopped and any remaining oil left in the barge.

3.4 BOOM MEASUREMENTS

Data from differential pressure transmitters and strain links on the instrumented OHMSETT boom will be collected and stored on a mini-computer on-site. Visual observations, photography and video, from both boats and the helicopter, will be used to document the sea-keeping and oil retention characteristics of all three booms. Oil loss rates will be estimated visually. Relative tow speeds will be measured by timing small drifters over a known distance. Tow boat separation heading and orientation will be recorded intermittently. Draft data sheets are given in Appendix I.

3.5 SKIMMER MEASUREMENTS

The measurements to evaluate skimmer performance will include recovery rate (determined by both an in-line flowmeter and tank soundings), emulsion and free-water content (from periodic samples), recovered product physical properties (density, viscosity, etc.) and total volume recovered (by measuring the volume in storage). In addition, visual, video and photographic observations will be used to evaluate qualitative aspects of skimmer performance such as sea keeping, oil entrainment etc. Draft data sheets are given in Appendix I. A steam siphon will be used to break any emulsions; its operating parameters and efficiency will be monitored.

3.6 METEOROLOGICAL MEASUREMENTS

Wind speed and direction and air temperature will be monitored throughout the test day using a weather station mounted on the mast of one of the large vessels.

3.7 OCEANOGRAPHIC MEASUREMENTS

Wave height and frequency data from a wave rider buoy moored at the site will be recorded continuously by a remote computer on one of the large vessels. Surface drift velocities will be determined periodically using drifters in conjunction with aerial video recording. Position fixes and "over the ground" drift will be determined by LORAN-C.

3.8 OTHER

A Polaroid camera attachment will be mounted on one of the search radars aboard a large vessel to document whether or not such a radar can detect oil slicks when the sea clutter suppression is turned down.

4.0 LOGISTICS

4.1 VESSELS

The following CCG vessels will be used for the experiment. The tasks for each are also delineated. Equipment to be carried aboard each is listed in Section 5.0.

CCGS Jackman (or Grenfell)

- converted supply boat
- L.O.A. = 56.1 m
- carry, deploy and retrieve Ro-Boom
- carry, deploy, hold and retrieve Vikoma Ocean Pack boom
- carry and deploy wave rider buoy
- oceanography and meteorology
- carry spare generator for Vikoma Ocean Pack

CCGS Sir Humphrey Gilbert

- carry, deploy and retrieve CG 208, Boston Whaler and FRC
- carry helicopter
- carry backup Vikoma Sea Pack
- recover OHMSETT boom
- recover waverider
- radar and positioning watch
- search radar oil detection tests
- observer/VIP/press platform

CG 206

- converted Cape Islander
- L.O.A. = 12.7 m
- twin 315 hp inboard diesel
- hold one end of OHMSETT boom
- conduct OHMSETT data collection
- tow OHMSETT boom to CCGS Sir Humphrey Gilbert

CG 208

- seatruck
- L.O.A. - 13 m
- twin 215 hp inboard diesel
- carry, deploy and hold OHMSETT boom
- assist with data collection
- wash OHMSETT boom with fire hose

CG 212

- converted aluminum hull workboat
- L.O.A. - 13.6 m
- twin 315 hp inboard diesel
- pull Ro-Boom from stern of CCGS Jackman
- wash Ro-Boom with fire pump
- standby to pull out Vikoma Sea Pack if required
- wash Vikoma Ocean Pack boom

CG 214

- converted aluminum hull workboat
- L.O.A. = 13.6 m
- twin 315 hp inboard diesel;
- position barge for oil release
- take Ro-Boom from CCGS Jackman and position between OHMSETT boom and Vikoma Ocean Pack
- return Ro-Boom to CCGS Jackman

In addition, one or two smaller boats (Boston Whaler and FRC) will be used for close observation of boom behaviour.

As well as the above CCG vessels, a dynamically positioned supply boat is required to undertake the following tasks:

- tow barge to and from site

- hold one end of Vikoma Ocean Pack boom
- carry and operate the Framo and H.O.S. skimmers
- carry two 5,000 gallon tanks and hoses for recovered oil storage
- pump recovered oil to dumb barge and tow barge back
- command centre
- steam siphon tests
- deploy Orion buoy after skimmer tests

4.2 HELICOPTER

A helicopter, capable of flying offshore, is required for the following tasks,

- direct operations
- aerial photography and video
- monitor oil discharge

This helicopter will be based on the CCGS Sir Humphrey Gilbert. A larger helicopter will be used for pre and post spill site monitoring, including tracking an Orion buoy.

4.3 TRANSPORTATION

Transportation to, from and in St. John's is each individual's responsibility.

4.4 COMMUNICATIONS

Good communications is the key to the success of the experiment. Since the majority of the vessels will be CCG owned, the CCG oil spill channel (81A) will be used for all vessel related communications. It may be necessary to supply a suitable radio to the chartered supply boat since

81A is a restricted channel. Helicopter/ship communications will be on channel 19A. The OHMSETT team will use hand-held radios with frequencies of 165.5875 or 164.450 MHZ. CCGS Sir Humphrey Gilbert will monitor channel 11 and CCGS Jackman will monitor channel 16.

In order to prevent confusion on the command ship and helicopter, radio traffic should be kept to a minimum. All radio communications will be tape recorded to provide a record of the day's events.

4.5 SAFETY

Safety during the dry run and test is paramount. All personnel at the test site must wear floater suits or jackets. A safety briefing will be held in St. John's prior to the dry run. The ship's captain or boat operator has ultimate authority over surface operations; the pilot has ultimate authority over airborne operations.

4.6 SHIPPING AND STORAGE

All materials and equipment for the experiment that cannot be hand carried must be received in St. John's the week prior to the tests. The shipping address is

Mr. W. Ryan, BMG
Canadian Coast Guard
Newfoundland Region
Canadian Coast Guard Emergencies
Bldg. 204, Pleasantville
St. John's, Newfoundland
Canada

Attn: OFFSHORE BOOM TRIALS
Telephone: (709) 772-5171
Telex: 016-4530 (a/b CCGTC SNF)

For mail, the address is

P.O. Box 1300
St. John's, Newfoundland
A1C 6H8

Notification of each shipment, including number of pieces, general description, carrier, waybill number(s), shipper, shipping date and estimated arrival date in St. John's should be sent to Ian Buist of S.L. Ross at:

Telephone: (613) 232-1564
Telex: 063-666 (a/b CNCP EOS TOR)
after the answerback is received the first line of your message must be .TO 21:XRE001 with the period in the first column

The shipping information will be telexed to St. John's for confirmation of receipt and shipping damage reports.

5.0 EQUIPMENT LIST

(by end use location; supplier noted in brackets)

CCGS Jackman (or Grenfell)

* Vikoma Ocean Pack and spare generator
* Ro-Boom and reel pack (CCG Mulgrave)
* wave rider buoy (Seakem)
* wave data receiver/computer (Seakem)
* met. station (DFD)
* tape recorder/video (SLR)
* 2 bales sorbent pads (CCG)
* 2 open top drums (CCG)
* surface drifters (DFD)

CCGS Sir Humphrey Gilbert

* CG 208, Boston Whaler and FRC (CCG)
* Vikoma Sea Pack (CCG)
* helicopter and fuel (CCG)
* Polaroid camera and mount (SLR)
* tarp to place recovered OHMSETT boom on (CCG)
* 2 bales sorbent pads (CCG)
* 2 open top drums (CCG)

CG 206

* data collection computer (OHMSETT)
* surface drifters (OHMSETT)

CG 208

* instrumented boom (OHMSETT)
* fire pump and hose (CCG)
* surface drifters (OHMSETT)

CG 212

* fire pump/hose (CCG)
* surface drifters (DFD)

CG 214

* surface drifters (DFD)
* TK 4 pumps for oil release (CCG)

Other supply boat

* barge (CCG)
* Framo ACW-400 (CCG)
* Heavy Oil Skimmer (CCG)
* two 5,000 gallon deck tanks (CCG)
* transfer pump & floating hose (CCG)
* steam siphon and steam generator
* skimmer performance measurement equipment (OHMSETT)
* oil sampling equipment (OHMSETT)
* 4 bales sorbent pads (CCG)
* 2 open top drums (CCG)
* marine VHF radio with 81A (CCG)
* surface drifters (CCG)
* floodlights for night operations
* work shacks (CCG)
* one Orion buoy (CCG)

Helicopter

* marine VHF radio with 19A
* 70 mm aerial camera c/w mount (AEROMAP)
* 1/2 inch video system c/w mount (AEROMAP)

St. John's

* storage tank for oil (CCG)
* transfer pump/hoses (CCG)
* heated indoor warehouse/storage (CCG)
* meeting room (CCG)

Dartmouth

* tanker truck/storage for oil (EPS)

6.0 PROJECT SCHEDULE AND TEST DAY SEQUENCE OF EVENTS

6.1 PROJECT SCHEDULE

The project timetable is shown on Figure 9. Triangles indicate starting dates, circles indicate completion dates and decision points. The dry run is tentatively set for Monday, September 21, 1987. All personnel should be in St. John's for a meeting at 1800 h on Sunday September 20.

6.2 TEST DAY SEQUENCE OF EVENTS

The proposed timing of the day's activities is shown on Figure 10. Figure 11 shows a diagram of the various tasks. It should be noted that a dry run, involving only deployment and retrieval of all equipment, will be held two days before the test day.

In fall there are about 10 to 12 hours of daylight. Based on the timing shown on Figure 10, departure from St. John's would be up to 4 hours before sunrise. Departure times will be finalized, based on final test site selection and the dry run results, the day before the test.

FIGURE 9
PROJECT TIMETABLE

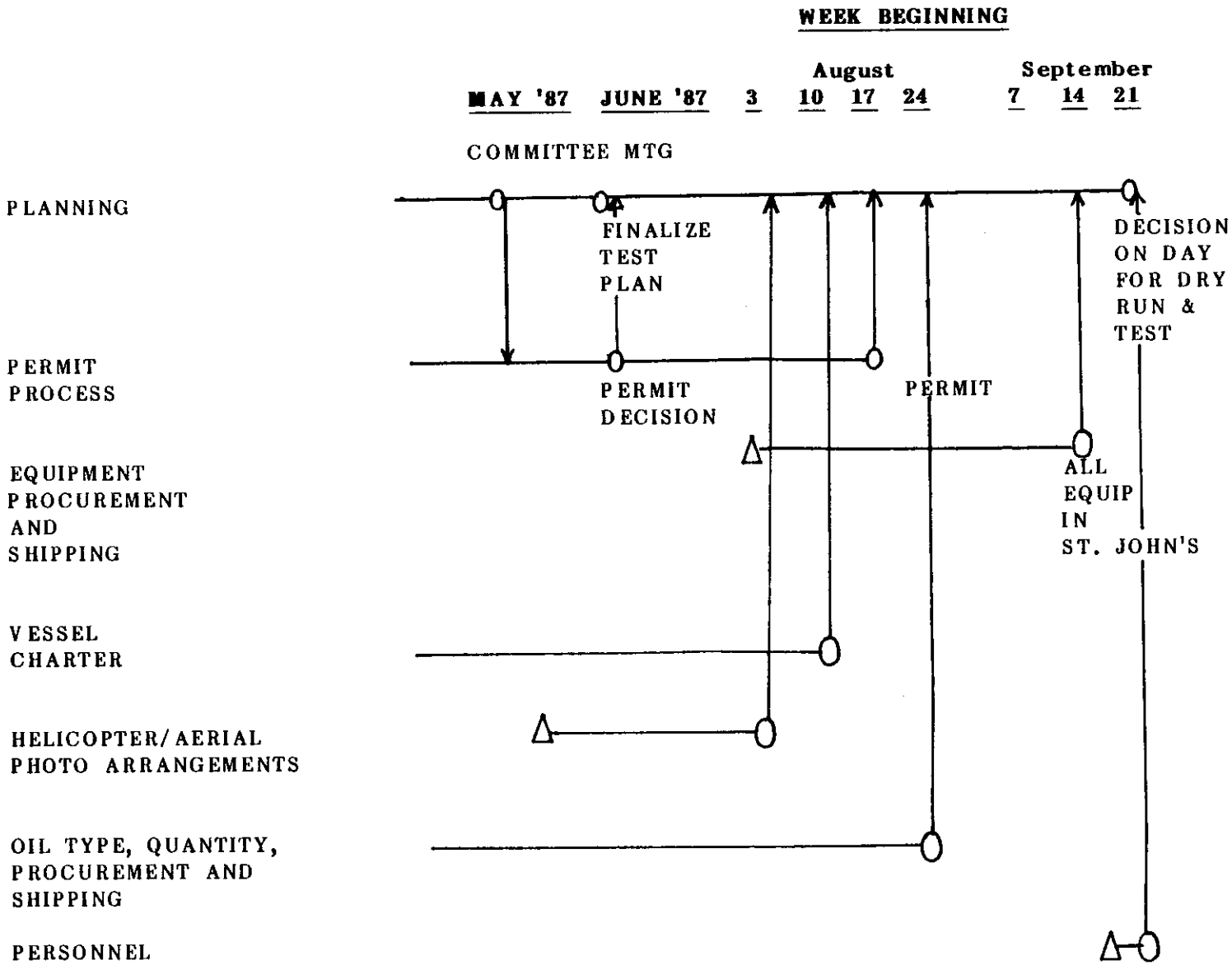


FIGURE 10

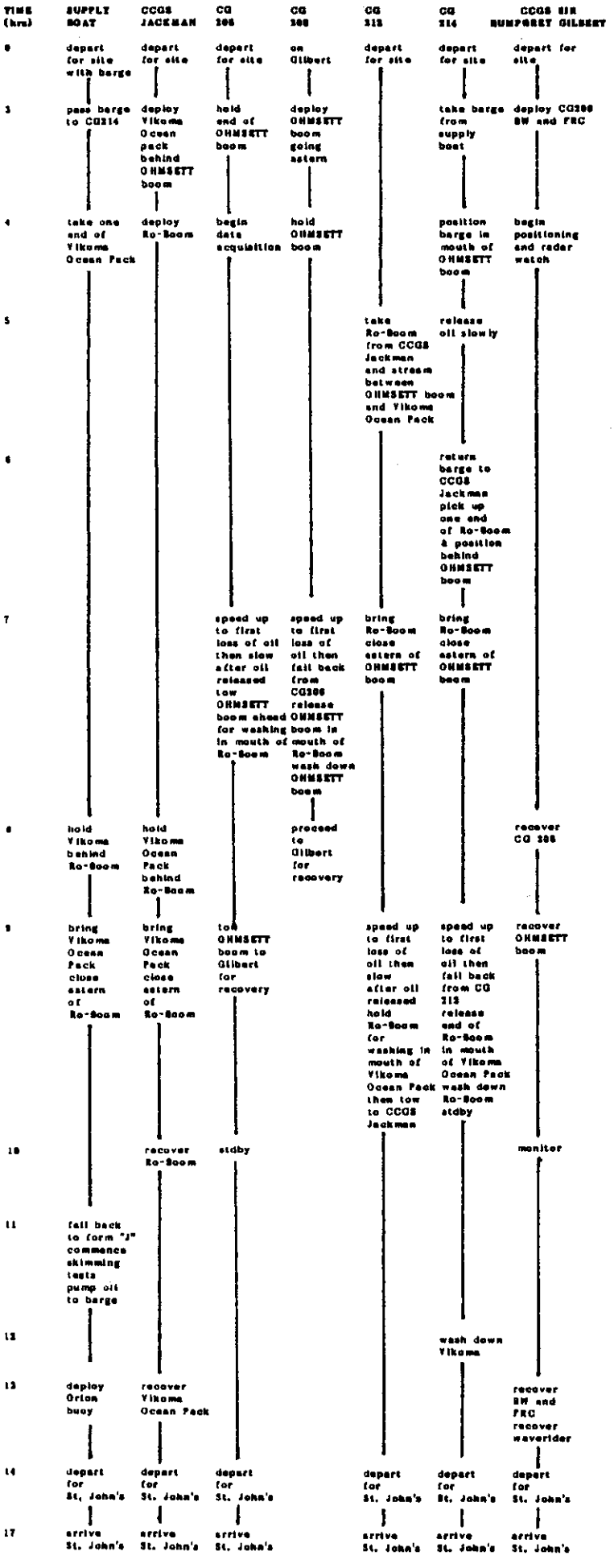
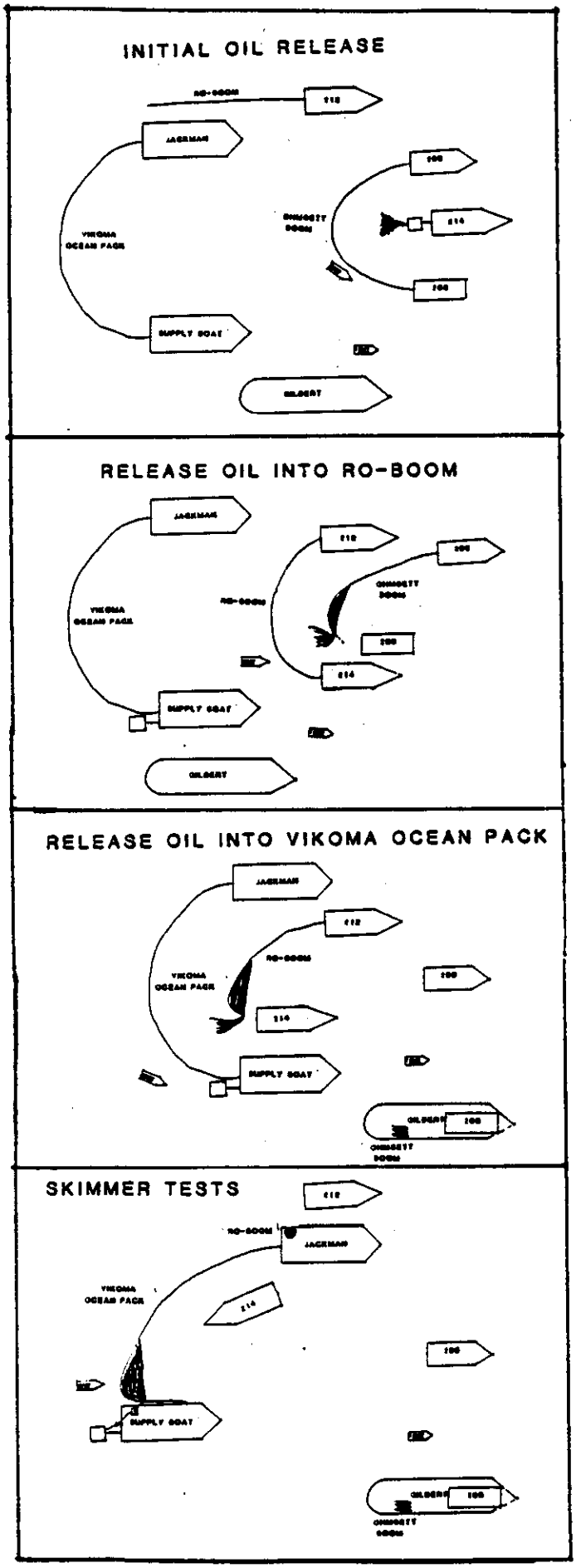

TIME (hrs)
SUPPLY BOAT
CCGS JACKMAN
CG 286
CG 288
CG 213
CG 214
CCGS SIR HUMPHREY GILBERT
0
depart for site with barge
depart for site
depart for site
on Gilbert
depart for site
depart for site
depart for site
3
pass barge to CG214
deploy Vikoma Ocean pack behind OHMSETT boom
hold end of OHMSETT boom
deploy OHMSETT boom going astern
take barge from supply boat
deploy CG288 BW and FRC
4
take one end of Vikoma Ocean Pack
deploy Ro-Boom
begin data acquisition
hold OHMSETT boom
position barge in mouth of OHMSETT boom
begin positioning and radar watch
5
take Ro-Boom from CCGS Jackman and stream between OHMSETT boom and Vikoma Ocean Pack
release oil slowly
6
return barge to CCGS Jackman pick up one end of Ro-Boom & position behind OHMSETT boom
7
speed up to first loss of oil then slow after oil released tow OHMSETT boom ahead for washing in mouth of Ro-Boom
speed up to first loss of oil then fall back from CG286 release OHMSETT boom in mouth of Ro-Boom wash down OHMSETT boom
bring Ro-Boom close astern of OHMSETT boom
bring Ro-Boom close astern of OHMSETT boom
8
hold Vikoma behind Ro-Boom
hold Vikoma Ocean Pack behind Ro-Boom
proceed to Gilbert for recovery
recover CG 286
9
bring Vikoma Ocean Pack close astern of Ro-Boom
bring Vikoma Ocean Pack close astern of Ro-Boom
tow OHMSETT boom to Gilbert for recovery
speed up to first loss of oil then slow after oil released hold Ro-Boom for washing in mouth of Vikoma Ocean Pack then tow to CCGS Jackman
speed up to first loss of oil then fall back from CG 213 release end of Ro-Boom in mouth of Vikoma Ocean Pack wash down Ro-Boom stdby
recover OHMSETT boom
10
recover Ro-Boom
stdby
monitor
11
fall back to form "J" commence skimming tests pump oil to barge
12
wash down Vikoma
13
deploy Orion buoy
recover Vikoma Ocean Pack
recover BW and FRC recover waverider
14
depart for St. John's
depart for St. John's
depart for St. John's
depart for St. John's
depart for St. John's
depart for St. John's
17
arrive St. John's
arrive St. John's
arrive St. John's
arrive St. John's
arrive St. John's
arrive St. John's

FIGURE 11 - SCHEMATIC OF TEST TASKS



7.0 ENVIRONMENTAL PROTECTION

Every effort will be made to ensure that no oil remains behind at the end of the tests. The proposed site and test timing was suggested by CCG-St. John's to specifically avoid interference with local fisheries and birds, after consultations with local fishermen and regulatory authorities.

7.1 PRE-SPILL SITE RECONNAISSANCE

The afternoon prior to the tests the area will be overflown to ensure that no fishing activity is underway and that no major bird populations are in the area.

7.2 OIL DISCHARGE

The oil would be discharged slowly (2 to 4 m^3/min) by pumping in a controlled manner from individual holds in the dumb barge positioned in the mouth of the OHMSETT boom. The size and control of the slick in the boom pocket will be constantly monitored from the helicopter. Should the slick fill 75% of the boom or begin to leak from the boom the discharge will be stopped and any remaining oil left on the barge.

7.3 BACK-UP BOOMS

At all times during the oil discharge, boom testing and first-loss testing a back-up boom will be positioned behind the test boom to capture and contain any oil losses. The exception to this is the testing of the Vikoma Ocean Pack boom, which will not involve first loss testing and will be conducted at speeds far below that resulting in boom failure, a Vikoma Sea Pack will be on site in case of problems with the Vikoma Ocean Pack.

7.4 BOOM WASHING

After testing of each boom and the release of the contained oil, the boom will be streamed in the mouth of the next boom and washed off with fire hoses. All care will be taken to ensure that the washed off oil drifts back into the next boom's pocket. As the skimming of the oil from the Vikoma Ocean Pack boom progresses, the oil-side of the boom will be hosed off, with the removed oil flushed toward the skimmer for recovery. This procedure will ensure that no oil is released when the Vikoma Ocean Pack boom is recovered. Sorbent pads will be used to wipe off each boom as it is recovered.

7.5 POST-SPILL SITE MONITORING

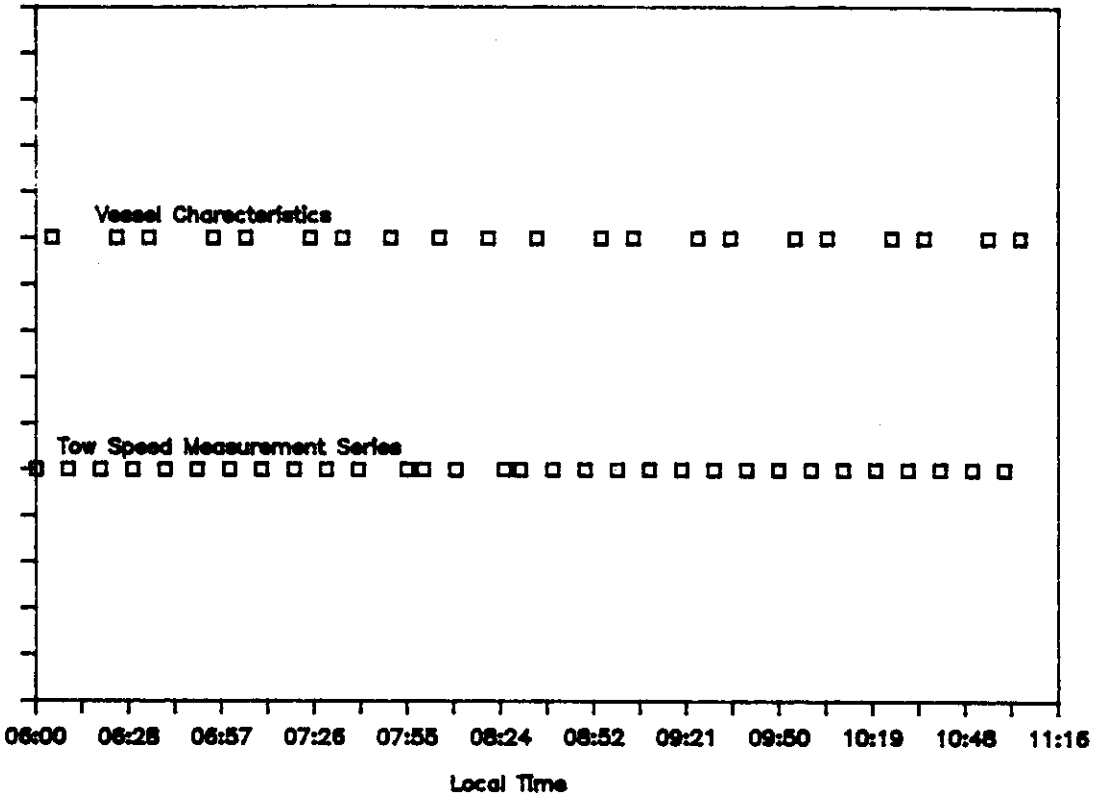
After the skimming test a radio-trackable Orion spill buoy will be deployed at the test site. The day following the tests a helicopter will be used to locate the test site and ensure that no oil remains.

APPENDIX I

DRAFT DATA SHEETS

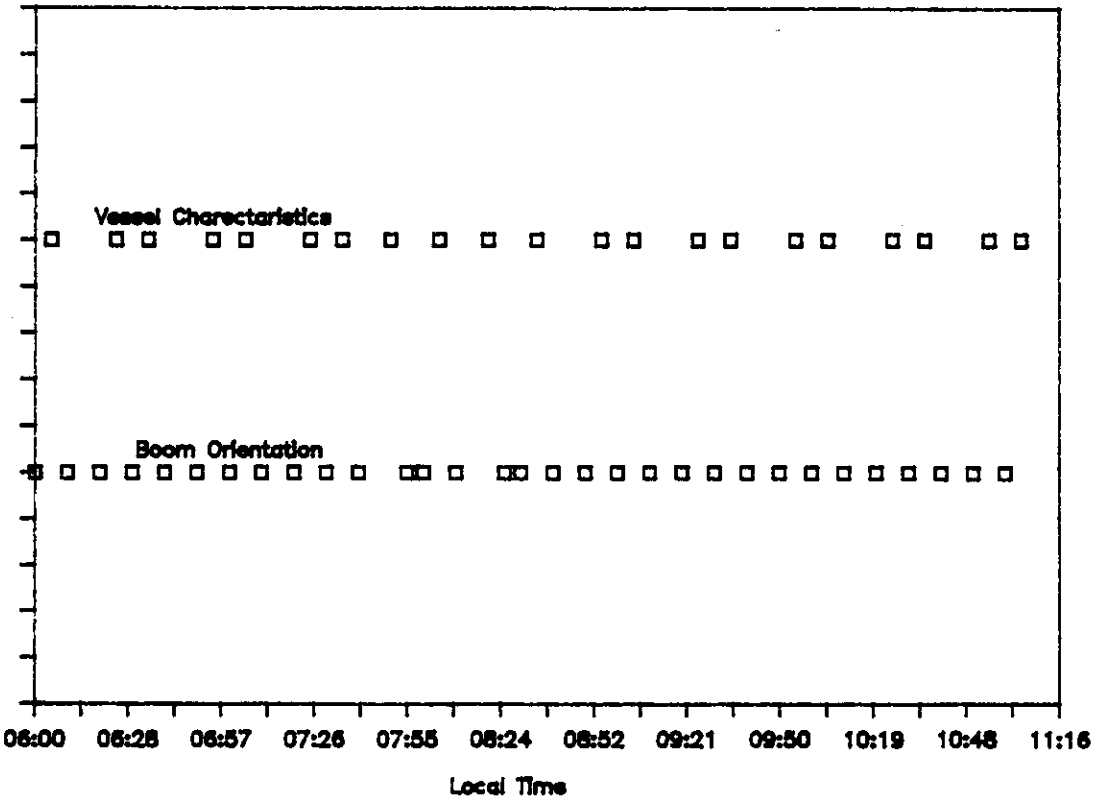
CCG 208

Data Logging Schedule



CCG 208

Data Logging Schedule



Data Record CCG 206

Time	Measure-ment	Heading 1	Heading 2	Heading 2	Engine Speed	Boat Heading
06:00	Headings					
06:05	Ves Chars					
06:10	Headings	27/1000	40/130	90/100		
06:20	Headings	30/1160	55/58	85/90		
06:25	Ves Chars				1300	010
06:30	Headings	32/1010	54/65	85/95		
06:35	Ves Chars				1300	008
06:40	Headings	33/980	41/60	90/80		
06:50	Headings	35/950	40/60	85/100		
06:55	Ves Chars				1200	009
07:00	Headings					
07:05	Ves Chars					
07:10	Headings					
07:20	Headings					
07:25	Ves Chars					
07:30	Headings					
07:35	Ves Chars					
07:40	Headings					
07:50	Ves Chars					
07:55	Headings					
08:00	Headings					
08:05	Ves Chars					
08:10	Headings					
08:20	Ves Chars					
08:25	Headings					
08:30	Headings					
08:35	Ves Chars					
08:40	Headings					
08:50	Headings					
08:55	Ves Chars					
09:00	Headings					
09:05	Ves Chars					
09:10	Headings					
09:20	Headings					
09:25	Ves Chars					
09:30	Headings					
09:35	Ves Chars					
09:40	Headings					
09:50	Headings					
09:55	Ves Chars					
10:00	Headings					
10:05	Ves Chars					
10:10	Headings					
10:20	Headings					
10:25	Ves Chars					
10:30	Headings					
10:35	Ves Chars					
10:40	Headings					
10:50	Headings					
10:55	Ves Chars					
11:00	Headings					
11:05	Ves Chars					

Data Record CCG 208

Time	Measure-ment	Elap Time	Elap Time	Elap Time	Engine Speed	Boat Heading
06:00	Tow Speed					
06:05	Ves Chars				1200	008
06:10	Tow Speed	1:15	2:30	3:00		
06:20	Tow Speed	1:20	2:15	3:20		
06:25	Ves Chars				1300	009
06:30	Tow Speed	1:30	2:45	3:15		
06:35	Ves Chars				1200	007
06:40	Tow Speed	1:25	2:31	3:35		
06:50	Tow Speed	1:15	2:20	3:30		
06:55	Ves Chars				1100	010
07:00	Tow Speed	1:20	2:30	3:70		
07:05	Ves Chars				1250	012
07:10	Tow Speed					
07:20	Tow Speed					
07:25	Ves Chars					
07:30	Tow Speed					
07:35	Ves Chars					
07:40	Tow Speed					
07:50	Ves Chars					
07:55	Tow Speed					
08:00	Tow Speed					
08:05	Ves Chars					
08:10	Tow Speed					
08:20	Ves Chars					
08:25	Tow Speed					
08:30	Tow Speed					
08:35	Ves Chars					
08:40	Tow Speed					
08:50	Tow Speed					
08:55	Ves Chars					
09:00	Tow Speed					
09:05	Ves Chars					
09:10	Tow Speed					
09:20	Tow Speed					
09:25	Ves Chars					
09:30	Tow Speed					
09:35	Ves Chars					
09:40	Tow Speed					
09:50	Tow Speed					
09:55	Ves Chars					
10:00	Tow Speed					
10:05	Ves Chars					
10:10	Tow Speed					
10:20	Tow Speed					
10:25	Ves Chars					
10:30	Tow Speed					
10:35	Ves Chars					
10:40	Tow Speed					
10:50	Tow Speed					
10:55	Ves Chars					
11:00	Tow Speed					
11:05	Ves Chars					

Data Record Oil Recovery

Time	Flow Rate	Discharge Pressure	Sample ID	Discharge Tank ID
12:00				
12:10				
12:20				
12:30				
12:40				
12:50				
13:00				
13:10				
13:20				
13:30	STARTING AT 13:35			
13:40	55%	28%	1007	II
13:55	60	26	1008	II
14:00	58	30	10	II
14:10	56	32	101	II
14:25	54	26	11	II
14:30	62	28	12	II
14:40	— CHANG			
14:50	72		1013	I
15:00	68		1014	I
15:10	66		1015	I
15:20	69		1016	I
15:30	71	30	1017	I
15:40				
15:50				
16:00				
16:10				
16:20				
16:30				
16:40				
16:50				
17:00				

Data Record Oil Recovery

Time	Measurement	Tank ID	Measured Depth	
12:00	Depth	I		
12:10	Depth			
12:20	Depth			
12:30	Depth			
12:40	Depth			
12:50	Depth			
13:00	Depth			
13:10	Depth			
13:20	Depth			
13:30	Depth			START 13:30
13:40	Depth	II	2	
13:55	Depth	II	4 1/2	
14:00	Depth	II	8 1/2	
14:10	Depth	II	10 1/2	
14:25	Depth	II	14 1/2	
14:30	Depth	II	17	
14:40	Depth	II	20	14:30
14:50	Depth			
15:00	Depth			
15:10	Depth			
15:20	Depth			
15:30	Depth			
15:40	Depth			
15:50	Depth			
16:00	Depth			
16:10	Depth			
16:20	Depth			
16:30	Depth			
16:40	Depth			
16:50	Depth			
17:00	Depth			

Approximate Start of Pumping 13:30
Approximate End of Pumping 14:31
Measured Stopwatch Pump Time 2:01:30
Ending Depth 21 INCHES
Stripped Height 18 INCHES
Sample Identifications (3) 2001, 2002, 2003
Data Collected By Data Collector
Data Recorded By [illegible], Date